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BAETINE MAYFLIES FROM FLORIDA (EPHEMEROPTERA)[1]

LEWIS BERNER

Since Nathan Banks described *Callibaetis floridanus* from Biscayne Bay in South Florida forty years ago (1900), no additional species of Baetinae have been reported from the state. Even Banks' species has been mentioned only once in the literature, when it was redescribed by Traver in "The Biology of Mayflies" in 1935. During the past three years, I have been studying the Ephemeroptera of Florida, and in the course of this work have found at least fifteen additional species of Baetinae, representing seven genera (including *Callibaetis);* three of the species are undescribed. Among the sixteen species of this subfamily, six are represented only by nymphs or by nymphs and females, both forms of limited taxonomic value, and because of the uncertainty in identification, such species will not be treated here. The present contribution includes the records and descriptions of those identified Baetine species which are now definitely known to occur in Florida; their ecological distribution will be discussed in a later paper.

The lack of flowing water in South-central and Southeast Florida has kept all lenitic forms out of this region, and here *Callibaetis floridanus* is the only representative of the Baetinae. Northwest Florida, on the other hand, has numerous, moderately flowing streams in which nymphs of all of the forms described in this paper can be found.

Rearing has been carried out entirely in the laboratory. A small stream of air forced into an aquarium proved to be quite effective for keeping mature, stream-inhabiting, Baetine nymphs alive for several days and allowing many of them to emerge, an act which they seem to perform with difficulty in quiet water. However, some of the species occur in regions from which it is impossible to transport such intolerant nymphs and consequently,

[1]Contribution from the Department of Biology, University of Florida.

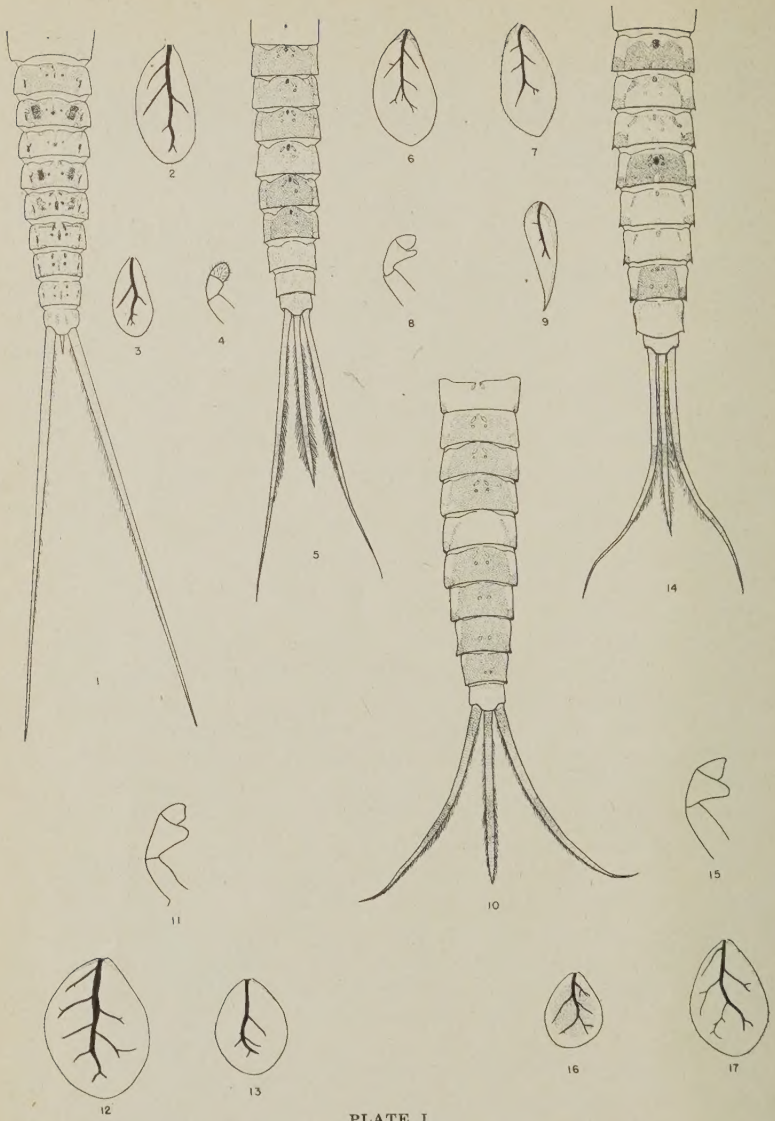

PLATE I

Fig. 1. *Pseudocloeon alachua*, abdomen of nymph.
Fig. 2. *Pseudocloeon alachua*, fourth gill.
Fig. 3. *Pseudocloeon alachua*, seventh gill.
Fig. 4. *Pseudocloeon alachua*, labial palp of nymph.
Fig. 5. *Baetis spiethi*, abdomen of nymph.
Fig. 6. *Baetis spiethi*, fourth gill.
Fig. 7. *Baetis spiethi*, sixth gill.
Fig. 8. *Baetis spiethi*, labial palp of nymph.
Fig. 9. *Baetis spiethi*, seventh gill.
Fig. 10. *Baetis spinosus*, abdomen of nymph.
Fig. 11. *Baetis spinosus*, labial palp of nymph.
Fig. 12. *Baetis spinosus*, fourth gill.
Fig. 13. *Baetis spinosus*, seventh gill.
Fig. 14. *Acentrella ephippiatus*, abdomen of nymph.
Fig. 15. *Acentrella ephippiatus*, labial palp of nymph.
Fig. 16. *Acentrella ephippiatus*, seventh gill.
Fig. 17. *Acentrella ephippiatus*, fourth gill.

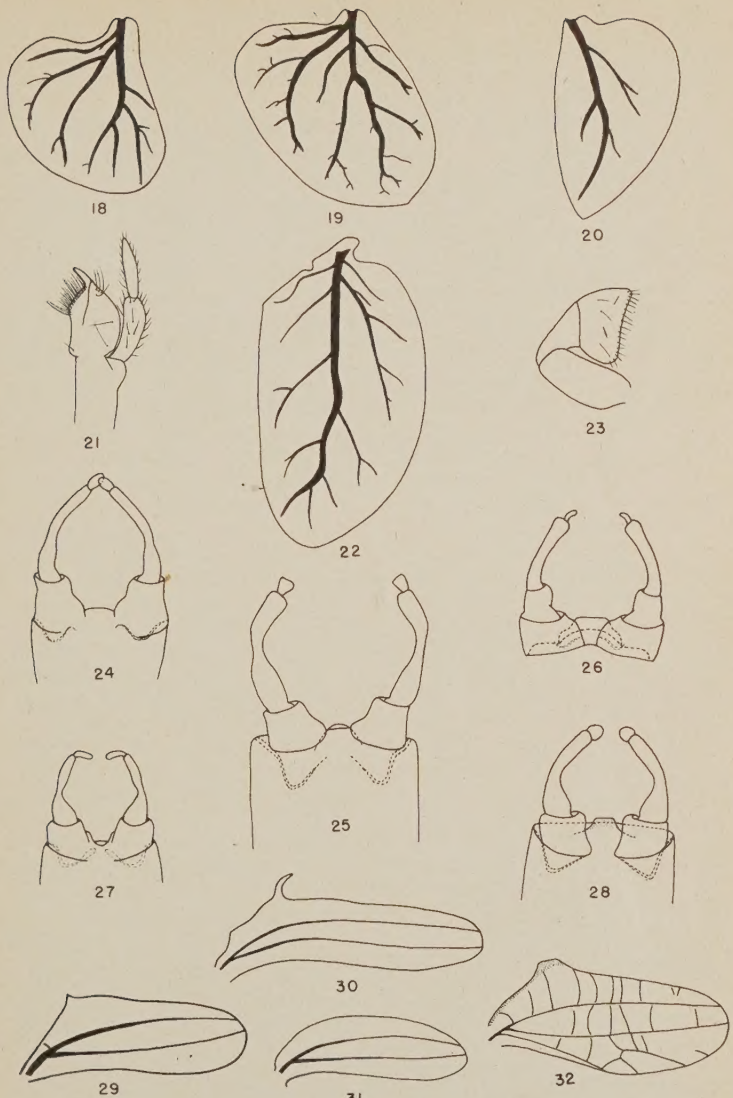

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PLATE II

Fig. 18. *Centroptilium viridocularis*, first gill.
Fig. 19. *Centroptilium viridocularis*, fourth gill.
Fig. 20. *Centroptilium viridocularis*, seventh gill.
Fig. 21. *Callibaetis floridanus*, maxilla of nymph.
Fig. 22. *Callibaetis floridanus*, seventh gill.
Fig. 23. *Centroptilium viridocularis*, labial palp of nymph.
Fig. 24. *Pseudocloeon alachua*, genitalia of male imago.
Fig. 25. *Callibaetis floridanus*, genitalia of male imago.
Fig. 26. *Centroptilium viridocularis*, genitalia of male imago.
Fig. 27. *Baetis spiethi*, genitalia of male imago.
Fig. 28. *Acentrella propinquus*, genitalia of male imago.
Fig. 29. *Baetis spiethi*, hind wing of male imago.
Fig. 30. *Centroptilium viridocularis*, hind wing of male imago.
Fig. 31. *Acentrella propinquus*, hind wing of male imago.
Fig. 32. *Callibaetis floridanus*, hind wing of male imago.

in these instances, the association of adult and nymph has had to be inferred.

I have followed Ide's method of describing immatures, in which the description is not based on a single specimen but on the average of a number of specimens.

I wish to express my appreciation to Professor T. H. Hubbell, Department of Biology, University of Florida, for critizing the manuscript, to Dr. H. H. Hobbs, of the same department, for valuable suggestions concerning drawings, and to friends who have collected numerous mayflies for me. In recording locality records of Florida materials examined, the name of the collector is placed in parentheses along with the date of the collection; records without such names are my own.

CALLIBAETIS Eaton

Callibaetis floridanus Banks

MALE IMAGO (in alcohol):

Measurements: Length of body—5.3-7.0 mm.; fore wing—4.7-6.5 mm.; caudal filaments—9.9-12.6 mm.

Head: Light brown; anterior margin of frontal shelf red-brown, remainder whitish-hyaline suffused with brown; median carina white; vertex dark brown between compound eyes. Base of ocelli brown, distal portion white; brown dash under lateral ocelli; brown markings extending from anterior border of each lateral ocellus almost to dorso-proximal margin of median ocellus. Turbinate portion of compound eyes orange dorsally, remainder yellowish-white except for dark-brown line at base on medial side; lower portion of eye black. Basal segment of antenna white ventrally, dusky dorsally, distal margin red; second segment whitish ventrally, dorsally brown; flagellum brownish becoming pale distally. Ventral surface of head yellowish-white.

Thorax: Brown marked with tan; freckled with brown (a very small seta arising from each spot). Median line of pronotum light tan; entire pronotum bordered by dark brown line; submedian tan patch on posterior border. Mesonotum predominantly light brown; median line reddish; anterior border with thin dark brown line; submedian brown stripes bounded laterally by tan stripe; lateral and posterior portions of scutum dark brown; face of ridge at posterior border of scutum yellowish-white, this followed by brown; scutellum tan, posterior border dark brown. Metanotum dark brown; mid-portion of anterior margin dark brown, midportion of posterior border tan. Pleura brownish marked with yellow; large brown areas anterior to each coxa; yellow stripe extending downward from root of mesothoracic wing. Prosternum yellowish-white; brown border on anterior and posterior margins, also brown line on medial side of each coxa. Mesosternum yellow marked with brown; anterolateral portion brown, medial part yellow; posterolateral regions brown; dark brown border on posterior and anterior margins and also around coxae. Metasternum predominantly yellowish-brown; brownish in anterior portion, white between coxae, dark brown along caudal border.

Wings: Hyaline, veins not colored; mesothoracic wings with stigmatic areas whitish; this whitish area extending through costal border; intercalaries double near tip of wing, single along outer margin; twenty to twenty-five cross-veins posterior to R_1. Several cross-veins of metathoracic wings incomplete (fig. 32).

Legs: Coxa marked with brown; femur with obsolescent reddish spots arranged longitudinally on outer side; trochanter, tibia, and tarsus white. Claws brown, blunt claw whitish at tip.

Abdomen: Freckled with obsolescent brownish spots (a very small seta arising from each spot). Tergite 1 brown in mid-region, laterally yellowish-brown; 2-6 hyaline whitish; posterior margin in mid-region reddish; faint brownish submedian areas on posterior half of tergites 2-6; 7-10 predominantly brownish; anterior portion of 7 semi-hyaline; longitudinal whitish patches on 7-10; 7 and 8 light brown; 9 and 10 dark brown. Dark-brown, lateral streaks on tergites 1-9 in region of spiracles; reddish-brown streak just below this on sternites 2-9. Sternites 1-6 semi-hyaline with suggestion of brown along mid-portion of posterior border; 7 semi-hyaline along anterior border, predominantly white, reddish along posterior border. Sternites 8 and 9 white, red area on mid-region of posterior border.

Genitalia: White; terminal forceps segment short, expanded distally (fig. 25).

Caudal filaments: White, unmarked.

Variations: Femora with reddish spots absent; tarsal joinings brown. Brownish tinge in wings; veins yellow. Tergite 1 entirely brown; tergites 2-7 with faint, median, longitudinal stripe extending onto anterior half of tergite 8; tergites 7-10 mostly brown. Sternites 2-9 with blackish spot at mid-anterior margin, these spots fainter on 8 and 9; a pair of sub-median brown dashes near anterior margin of sternites 2-9; reddish streaks absent from sternites. Caudal filaments with faint brown annulations at joinings.

NYMPH (in alcohol):

The nymphs of *C. floridanus* are distinguished from the other Florida species by the relatively long second segment of the maxillary palp and by the absence of a flap on the seventh gill (figs. 21, 22).

Measurements: Length of body—5.8-8.7 mm.; length of caudal filaments—3.4-5.3 mm.

Head: Yellowish-brown; upper portion of compound eyes orange-brown, lower portion black. Lateral ocelli tan, medial side of base dark brown; middle ocellus brownish; dark brown basal area on dorsal side. Antennae yellowish. Segments of maxillary palp subequal.

Thorax: Brown with tan markings. Median area of pronotum tan, lateral to this, a triangular brown area with base along anterior margin; this triangle followed by broad yellowish area; a large brown spot in center of triangle; remainder of pronotum mostly brown. Meso- and metanotum brown. Pleura brown. Sternum yellowish-brown.

Legs: Yellowish-brown, marked with darker brown. Coxa yellowish, brownish on outer side; trochanter yellowish, tinged with brown; femur yellowish-brown, brown band near distal end; tibia, tarsus, and tarsal claw

yellowish-brown. Tibia and tarsus brown at their distal margins. Setae on legs brown.

Abdomen: Tergites predominantly brown. Tergite 1 mostly yellowish-brown; posterolateral margins brown; tergites 1-9 with faint submedian dashes at anterior margins; 7 and 8 with brown dashes in anteromedial region; 2-8 with yellowish, longitudinal lines extending length of tergites just medial to gills; anterolateral and posterolateral margins of tergites 2-9 pale, these pale areas separated by brown bar. Sternites yellowish, usually unmarked; if marked, brown triangle at mid-posterior margin of sternites 1-9 with base along posterior margin; apex of triangle extends to about middle of sternite; the base of triangle may spread out on caudal sternites and form a rather broad, brown, posterior band. In strongly marked specimens, there may be longitudinal brown dashes near lateral margins on sternites 1-9. Posterolateral spines on segments 6-9 about equal in size. Inconspicuous brownish spots (a very small seta arising from each spot) irregularly scattered over abdomen. Gills brownish-hyaline; gills 1 and 2 four lobed, 3-6 double and 7 single; tracheae prominent.

Caudal filaments: Yellowish-brown. Hairs yellowish-brown; in region of long hairs, filaments sometimes brownish but usually not different in color from remainder of tail. Spines at joints prominent, brown; at base of tails, prominent brown spines on every second segment; distally, to end of region of long hairs, spines occurring on every fourth segment, producing an annulate effect. Segments with the prominent spines usually brownish. Beyond region of long hairs, tails yellowish-brown.

Locality records: Alachua Co., general in Gainesville area (numerous records of adults and nymphs from April, 1937-March, 1940); Citrus Co., near Withlacoochee River (nymphs, March 25, 1938); Collier Co., Pinecrest (adults and nymphs, August, 1937); Columbia Co., Lake City (nymphs, May 12, 1937); Dade Co., Royal Palm State Park (adults, July 31, 1937), Pinecrest (adults, August 3, 1937), generally around Miami area (adults and nymphs, July-November, 1937); Gilchrist Co., Suwannee River (adult, April 5, 1938); Highlands Co., Child's Crossing (adults, August 11, 1938, T. H. Hubbell), Highlands Hammock State Park (nymphs, May 13, 1939, F. N. Young); Hillsborough Co., Tampa (nymphs, April, 1937 and 1938), Six-Mile Creek (nymphs, March, 1938), Little Fish-hawk Creek (nymphs, March, 1938); Jackson Co., Blue Springs Creek (adults, July 1, 1939); Lake Co., St. Johns River at Crow's Bluff (adult, September 12, 1938, J. R. Preer); Lee Co., Bonita Springs (nymphs, February 8, 1939, A. F. Carr); Levy Co., 6 miles N. E. Cedar Keys (nymphs April 9, 1937), Otter Creek (nymphs April 9, 1937), 4 miles S. Bronson (nymphs, November 14, 1937, H. H. Hobbs); Marion Co., Juniper Springs (nymphs, November 21, 1937), Oklawaha River at Eureka (nymphs, Feb-

ruary 12, 1938), Withlacoochee River (nymphs, March 25, 1938) ; Monroe Co., Pinecrest (adults, July, 1935, and December, 1937, F. N. Young; August 24, 1937), Turner's River (nymphs, December 25, 1935, F. N. Young) ; St. Johns Co., near Trout Creek (nymphs, April 23, 1938, F. N. Young) ; Sumter Co., 1 mile N. Sumter Co. line (nymphs, March 27, 1938) ; Taylor Co., Perry (nymphs, April 1, 1938, H. H. Hobbs; February 5, 1938) ; Volusia Co., Benson Springs (adults, August 30, 1938, J. R. Preer) ; Polk Co., Polk-Lake Co. line (nymphs, May 13, 1939, F. N. Young) ; Putnam Co., Welaka (adults, December 29, 1938; July 5, 1939, A. M. Laessle).

CENTROPTILIUM Eaton

Centroptilium viridocularis n. sp.

DIAGNOSIS: Abdominal tergites 2-6 of male imago semihyaline, yellowish-white; 7-10 ochraceous; width of metathoracic wing equal to one-fourth length; process of hind wing only slightly hooked; penis cover broadly truncate; distal forceps segment small, curved. (Figs. 26, 30.)

RELATIONSHIPS: On the basis of a combination of characters (mesothoracic color, red markings on tergites 2-6, color of tergites 7-10, and presence or absence of a projection on inner margin of second forceps segment), *Centroptilium viridocularis* is distinct from other described species. Comparison of Traver's drawings of the metathoracic wings (1935) of some species of *Centroptilium* with those of *C. viridocularis* leads me to associate the latter with *C. convexum, C. conturbatum,* or *C. rufostrigatum.* However, on the basis of Traver's drawings of genitalia, the relationships would seem to lie with *C. rufostrigatum* or *C. fragile.* Since both wings and genitalia are similar to those of *C. rufostrigatum,* these two species may possibly be the most closely related.

DESCRIPTION OF HOLOTYPIC MALE IMAGO (in alcohol) :

Measurements: Length of body—4.1 mm.; length of wing—3.7 mm.; length of caudal filaments—6.3 mm.

Head: White; reddish-brown mark where anteromedial angle of turbinate eye meets head; brown, submedian dash near base of antenna. Turbinate eyes large, oval, contiguous at base. When viewed from above, eyes completely cover pronotum and anterior portion of mesonotum. Upper portion of turbinate eyes greenish-yellow; a brown line around rim; basal portion grayish-brown; discontinuous dark-brown line separating the grayish-brown from upper greenish portion. Lower part of eye dark gray. Ocelli ringed with dark brown at base. Basal segments of antennae white, tinged with brown; flagellum dusky except at tip.

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Thorax: Pronotum brownish. Mesonotum grayish-yellow marked with white and brown; anterolateral borders white; a pair of brownish, submedian lines divergent anteriorly, fusing posteriorly; just lateral to these lines, in mid-region, a pair of white spots; posterior portion of scutum tinged with brown, scutellum brown. Metanotum dark-brown in anterior half, caudally yellowish-brown. Pleura white; sternum pale yellow.

Wings: Hyaline. Stigmatic area of fore wing granulate; no intercalaries in first interspace; four stigmatic cross-veins. Metathoracic wing process only slightly hooked; longitudinal veins two, no cross-veins; four times as long as wide.

Legs: White; claws dusky. Second left leg missing from holotype.

Abdomen: Tergites 2-6 semi-hyaline, yellowish-white; 7-10 ochraceous. Tergite 1 brownish. A red, transverse line along posterior border of tergites 2-8 becoming obsolescent in mid-region and extending to about midway between mid-dorsal and spiracular line. Reddish area at middle of intersegmental membranes of segments 2-6. Tergites 3 and 6 with light reddish, lateral areas; tergite 4 with very large, brown, lateral areas extending from spiracular line more than half-way to mid-dorsal line; 2 and 5 with faint indications of reddish, lateral areas; 5 and 6 have very faint reddish, submedian spots posteriorly; 7 hyaline in anterior portion, brown in middle, and ochraceous in posterior region. Sternites 2-6 yellowish-white; 7-9 white; reddish shading at anterior margin of 9; red, transverse line on intersegmental membrane of segments 5-9 extending almost to lateral border. Spiracular line black.

Genitalia: Yellowish-white.

Caudal filaments: White, unmarked.

Variation: Measurements of paratypes—body length 4.1-5.0 mm.; wing length—4.2-4.9 mm.; caudal filaments—7.5 mm. Turbinate eyes without brown rim. Markings at bases of antennae absent. No white markings on thorax; brown less extensive. Reddish, lateral areas on abdominal tergites more extensive; posterior sternites with reddish tinge. No intercalaries in first or second interspaces; five or six stigmatic cross-veins.

DESCRIPTION OF ALLOTYPIC FEMALE (in alcohol):

Measurements: Length of body—4.5 mm.; length of wing—5.1 mm.; length of caudal filaments—6.8 mm.

Head: Yellow; red-brown lines midway between compound eyes and median line; submedian, brown streak just medial to antennal base. Basal antennal segments yellow with reddish tinge; flagellum dusky.

Thorax: Pronotum brown at middle; paler near lateral margins; a pair of white spots at posterior margin and a pair at lateral border. Mesonotum grayish-yellow with white, lateral borders; caudal portion of scutum white; scutellum white on posterior margin. Metanotum brown.

Wings: As in male.

Legs: As in male.

Abdomen: Red lateral and posterior markings as in male. Tergites brownish-yellow; tergites 7 and 8 mostly light brown. Small, submedian, red dashes on 2 and 3 at middle of segment. Sternite 9 white, 8 with flecks of white. Tracheae prominent.

Caudal filaments: Yellowish-white.

DESCRIPTION OF NYMPH (in alcohol):

The nymphs of *C. viridocularis* occur in the slowly flowing portions of creeks in vegetation and leaf drift.

Measurements: Length of body—4.4-4.8 mm.; length of caudal filaments—2.1-2.2 mm.

Head: Pale brown; two pairs of submedian, brown spots on vertex; genae brownish; large, blackish-brown spot on outer margin of mandible; brown spot at ventrolateral corner of lateral ocellus. Turbinate portion of eyes slightly paler than head. Ocelli ringed with blackish-brown at base. Basal segments of antennae pale, tinged with brown; flagellum yellowish-white; antennae extend to posterior margin of second abdominal segment. Distal segment of labial palp dilated, broad (fig. 23).

Thorax: Pronotum grayish-brown; a dark-brown, longitudinal line mid-way between median line and lateral border ending at posterior margin in a dark-brown spot. Mesonotum grayish-brown; median line yellowish-white, enlarged at anterior margin and also just anterior to scutellum; on either side of anterior enlargement of median line, a dark-brown spot; on either side of posterior enlargement, a short, brown bar; at middle of mesonotum a pair of dark-brown spots; small area at base of wing pads and scutellum slightly paler than ground color of mesonotum. Metanotum brown; basal part of hind-wing pad brown; outer portion yellowish. Pleura dark brown. Sternum pale except for dark-brown area around bases of legs.

Legs: Brownish-yellow. Middle coxa with faint, brown spot on outer side; spot prominent on hind coxa, enlarged to cover most of outer surface; femur with an indefinite, brown band in distal third; tip of knee dark brown; tibia brown in mid-region; in upper-half of tibiae, on outer sides, a pale, U-shaped ridge superficially appearing to be an additional joint. Tarsus brownish basally becoming paler distally. Claws brown at base, distal half lighter brown; long, thin, almost three-fourths as long as tarsi.

Abdomen: Light brown; tergites slightly paler in anterior portion, darker posterior portion forms a large indistinct triangle with its base along posterior margin. On tergites 3 and 6, a dark-brown, longitudinal

band at inner margin of gills extending length of segment; running laterally from the middle of this bar, another bar which reaches to the lateral border; on 2, 4, 5, and 7 a brown area corresponding to the transverse bar on 3 and 6. A blackish-brown, median line on tergite 1, extending almost to posterior border; on 6, a large blackish-brown spot at middle; anterior border of 8 narrowly blackish-brown. Intersegmental membranes of segments 6-9 with blackish-brown transverse band. Sternites pale; anterior margins of 2-6 light brown, of 7-9 blackish-brown, this transverse band becoming wider on 8 and 9. On 2-7, a large lateral blackish-brown spot becoming quite large and elongated transversely on 8 and 9. Spines on lateral margins of segments 4-10. Gills single on all segments; straight along outer margin; tracheae prominent, branches mostly on inner side; gill 1 reddish-brown at base (figs. 18, 19, 20).

Caudal filaments: Yellow, annulate with brown. Outermost portions brown becoming paler at tip.

Holotype—male imago, in alcohol. Alachua Co., Hatchet Creek (June 24, 1939). In collection of Museum of Comparative Zoology.

Allotype—female imago, in alcohol. Alachua Co., Hatchet Creek (May 6, 1939). In collection of Museum of Comparative Zoology.

Paratypes—2 males, 1 female; 1 male in collection of Museum of Comparative Zoology, others in author's collection. Alachua Co., Santa Fe River (1 male, February 28, 1939), Hatchet Creek (1 male, July 9, 1938; 1 female, May 6, 1939).

Locality records: Alachua Co., Hatchet Creek (nymphs, May, 1938; adults, July, 1938; adults, April, May, and June, 1939), Santa Fe River at Poe Springs (nymphs, May 21, 1934, J. S. Rogers; adults, February, and nymphs, March, 1939), 1 mile W. Newnan's Lake (nymphs, August 13, 1938); Gilchrist Co., Suwannee River (nymphs, March 4, 1939); Hillsborough Co., Six-Mile Creek (nymphs, March 26, 1938); Jackson Co., Blue Springs Creek (adults, July 1, 1939); Leon Co., Ward (nymphs, June 5, 1938); Walton Co., Ebro (adults, June 7, 1938).

ACENTRELLA Bengtsson

The genus *Acentrella* Bengtsson was resurrected by Traver in 1937 for the reception of species removed from *Baetis* on the basis of the following characteristics: adult without costal projection of metathoracic wings and possessing a penis cover, nymph two-tailed. I have found two species in Florida which on the basis of adult characters should be assigned to *Acentrella*. However, the first of these, *A. ephippiatus,* has three-tailed nymphs. The other is the species which I have tentatively identified as *A. propinquus* (Walsh). Whatever the identity

of this species, it is very probable that it also possesses a three-tailed nymph. Clemens (1915) associated a three-tailed nymph with the species which he (perhaps incorrectly) regarded as that of Walsh, and it is almost certain that nymphs of the Florida form are represented in my large series of uncorrelated nymphs, all of which are three-tailed. In fact, I have never taken any two-tailed nymph except that of *Pseudocloeon* in Florida.

On the basis of the above observations, it seems rather doubtful whether *Acentrella* is worthy of generic status, but pending further investigation of the problem, it is here retained as a valid genus.

In corresponding with Dr. Traver concerning the status of *Acentrella*, she says, "Certainly, though, if some of the species in what I have called the 'propinquus group' of *Baetis* (Biology of Mayflies) have three tails as nymphs, whilst others have but two, it does not seem that the three-ness or two-ness of tails (that alone) should give them the rank of genus. There is, in addition, the difference in genitalia,—presence of penis-plate, etc.—and the lack of costal projection on hind wing. Do these two minor differences constitute grounds for a generic difference? . . . There is likely to be much shifting of generic as well as specific names in this group [Baetinae] for some time to come, I think, and many opinions for and against. . . . All told, I am at present inclined to let the genus *Acentrella* remain with us as such, until we have more proof."

Acentrella propinquus (Walsh)

In my collection, there is a series of seven males from Blue Springs Creek, near Marianna and one from the Santa Fe River which I am referring to *A. propinquus*. These specimens differ from Traver's (1935) description in that the head, thorax and terminal abdominal segments are paler than described (preserved in alcohol); all legs are white, unmarked; the spiracles have black circles around them but these are broken anteriorly and posteriorly; the wings are slightly smaller than the measurements given for this species (3.9 mm.); hind wings are 0.51 mm. in length, slightly over three times as long as wide. I am including camera lucida drawings of the hind wing and of the genitalia (figs. 28, 31).

Locality records: Alachua Co., Santa Fe River at Poe Springs (adult, October 25, 1939); Jackson Co., Blue Springs Creek (adult, July 1, 1939).

Acentrella ephippiatus (Traver)

I have three males of this species, all in poor condition, which correspond well with Traver's (1935) description; two others have much less extensive dorsal markings on pale tergites. This species has been reared only once, but since the adults have been taken at a creek in which three species of *Baetis* (or *Baetis*-like) nymphs occur, two of which have been frequently reared, it seems almost certain that the nymph I am describing is the immature of *A. ephippiatus*.

The nymphs, inhabitants of vegetation in moderately flowing creeks, are easily distinguished from other species of this genus and *Baetis* by the combination of the three-tailed condition, reddish coloration of the gills on segments one and seven, prominent red-brown tergites of segments 2, 5, and 8, and the reddish markings on the venter.

NYMPH (in alcohol):

Measurements: Length of body—4.0-4.9 mm.; length of caudal filaments—2.2-2.7 mm. (fig. 14).

Head: Yellowish-brown; brown spot at mid-posterior margin. Turbinate eyes orange. Two basal antennal segments brownish; flagellum long and thin; yellowish.

Thorax: Dorsally light brown; irregularly marked with yellowish-brown. Mesothoracic wing pads pale brown. Metathorax with submedian, brownish areas; medial to base of wing pad, a red-brown spot; brownish area at anterolateral margin. Ventrally light brown. Red-brown spots at mid-posterior margins of meso- and metasterna. Pleura yellowish-brown; anterior to base of third leg, a rectangular brown area. Second segment of labial palp expanded (fig. 15).

Legs: Yellowish; coxa and trochanter unmarked; femur with incomplete band about two-thirds distant from proximal end on outer side; incomplete distal femoral band; faint tibial and tarsal bands; claws yellowish, pectinate.

Abdomen: Predominantly yellowish-brown. Tergites 2, 5, 8 reddish-brown; others yellowish-brown. Some specimens with two pairs of submedian, pale spots on 2-9; on anterior segments, the anterior spot may be prolonged into a diagonal line; pale spot along mid-line at posterior margin of tergites 2-9; a red-brown spot on mid-line near anterior margin of tergites 2-9; just beneath inner margin of gills on tergites 2-8 reddish-brown line running diagonally outwards but indistinct on darker tergites; these lines are prominent anteriorly and gradually fade out toward posterior margin of segment. Posterolateral corner of all segments except 9 brown. Dorsum of segment 2 mostly brown except along anterior and lateral margins; the pale, anterior margin dipping into the reddish-brown area, forming two submedian V-shaped, pale blotches; these V-shaped areas confluent with the submedian pale lines. Tergite 5 red-brown with thin, anterior, pale margin and wide, lateral, pale margins; tergite 8 brown, pale markings as on 5 but less extensive on the anterior border. Venter yellowish-

brown; sternite 1 pale reddish-brown; large red-brown, transverse area at posterior margins of sternites 2-5; this red-brown area covering mid-posterior portion of these sternites; sternite 8 entirely red-brown. Gills hyaline. Gills 1 and 7 mostly red-brown, clear along margins, blending very well with tergites 2 and 8. Other gills clear; tracheae distinct (figs. 16, 17).

Caudal filaments: Long; yellowish with prominent, brown band at middle; in this brown area, segments stand out clearly; bands on outer filaments include six segments; on middle filament, eight segments; distal portion of tails brown.

Locality records: Alachua Co., Hatchet Creek (adult, April 2, 1938; adult, March 22 and June 24, nymphs, September 14 and October 11, 1938); Bay Co., 25 miles N. Panama City (nymphs, June 6, 1938), 28 miles N. Panama City (nymphs, June 6, 1938); Columbia Co., Falling Creek (nymphs, June 30, 1939); Jackson Co., Altha (nymphs, July 1, 1939); Okaloosa Co., Niceville (nymphs, June 7, 1938); Walton Co., 7 miles W. Ebro (nymphs, June 7, 1938), 16 miles W. Ebro (nymphs, June 7, 1938), 14 miles W. Freeport (nymphs and adult, June 7, 1938).

(To be continued)

A PROBABLE COLOR DIMORPHISM IN CHLORION HABENUM

(Hymenoptera, Sphecidae, Sphecinae)

By H. T. FERNALD, Winter Park, Florida

This insect was first described by Say (Insects of Louisiana, p. 14, 1832) from Louisiana. Cresson, not recognizing Say's species, described a specimen he received from Texas and noting its resemblance to his *Sphex lautum* called it a variety and at the end of his description of *lautum* wrote: "Should the variety with black abdomen prove to be a distinct species, it may be named *illustris*."

Structurally the females of Chlorion *lautum* and *habenum* are alike, the difference being in the color of the abdomen. In *lautum* this is near cinnamon as shown in Ridgeway's "Color Standards", while in *habenum* it is jet black. No males of either *lautum* or *habenum* having a black abdomen are known.

At the time my paper on this group of insects was published (Proc. U. S. Nat. Mus., 31, 1906) only four specimens of *habenum* were known, all females, taken in Texas, Mississippi and Alta Mira, Tamaulipas, Mexico. Since then others have been taken in Alabama, Honduras and twelve from College Station, Galveston, Hunt Co., Brazos Co., Hopkins Co., and Burleson Co., Texas, but with no males in the lot. Prof. R. W. Strandtman, who took the Texas specimens, writes me that he has often taken *lautum* at the same times, places and on the same plants with *habenum*, but all were males, which would suggest that the cinnamon-colored males of *lautum* are the males of *habenum*. The fact cinnamon-colored females of *lautum* do occur, though rarely, however, forces the belief that this species has females with the cinnamon abdomen in some cases and black in others.

The cinnamon-colored abdomen in the females, to judge from the few examples whose locality is known, occur in the northern part of the range of this insect and suggests the idea that this color of the abdomen in both sexes remains unchanged everywhere in the males, while further south the color in the females becomes black.

If this should prove correct it will involve a change of names and the species would then be known as *Chlorion (Ammobia) habenum* (Say), replacing *lautum* which would be applicable to the cinnamon-colored female only, as the designation of the cinnamon-colored variety of the female sex.

Aug. 22, 1940

Since the above was sent to the editor of this journal further evidence to support the view there taken has been obtained. On August 17th, 1940, while collecting on Goldenrod blossoms a male of this species with a cinnamon-colored abdomen was captured and about 15 minutes later a female with completely black abdomen was taken at the same place; the male being definitely what has been called *lautum* and the female, *habenum*.

On reviewing my notes on specimens of female *lautum* studied heretofore, I find that some, at least, of the females with cinnamon-colored abdomen show dark shades, particularly below. This would suggest that even in these specimens a tendency toward black is present.

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